IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

THERMO FINNIGAN LLC,

Plaintiff and
Counter- Defendant,

v.

APPLERA CORPORATION,
Defendant and
Counter-Plaintiff

Civil Action No. 04-1505-GMS

APPENDIX TO APPLERA CORPORATION'S
OPENING CLAIM CONSTRUCTION BRIEF

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January 20, 2006

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PURSUANT TO D. DEL. LR 26.2

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

THERMO FINNIGAN LLC, Plaintiff and Counterclaim Defendant, v. APPLERA CORPORATION, Defendant and Counterclaim Plaintiff.	Civil Action No.: 04-1505-GMS

PLAINTIFF THERMO FINNIGAN LLC'S RESPONSES TO DEFENDANT APPLERA CORPORATION'S FIRST SET OF INTERROGATORIES (NOS. 1-16)

Pursuant to Rules 26 and 33 of the Federal Rules of Civil Procedure, plaintiff Thermo Finnigan LLC ("Thermo Finnigan") makes the following responses and objections to defendant Applera Corporation's ("Applera's") First Set of Interrogatories as follows:

GENERAL OBJECTIONS

Unless otherwise indicated, Thermo Finnigan will not provide an answer to any interrogatory, or to any sub-part thereto, encompassed by the following objections:

1. Thermo Finnigan objects to any interrogatory that seeks information protected from disclosure by the attorney-client privilege, the attorney work product doctrine, the joint defense or common interest privilege, or any other applicable privilege or immunity. The inadvertent production by Thermo Finnigan of information protected from disclosure by any privilege or doctrine shall not constitute a waiver by Thermo Finnigan of such protections.

Interrogatory No. 2:

Separately for each claim of the '654 patent that Plaintiff asserts to be infringed by Applera, identify all Applera devices the use or operation of which is alleged to infringe the claim, state whether Plaintiff contends that Applera's infringement is direct or indirect through contributory or induced infringement, state whether Plaintiff contends such infringement is literal or under the doctrine of equivalents, and state the factual basis upon which Plaintiff relies to support these contentions, including an identification of the structure, feature or operation that Plaintiff contends corresponds to each limitation of the claim, and as to each claim limitation that Plaintiff contends is met by equivalents, describe why the allegedly equivalent structure, feature or operation of the accused product is not substantially different.

Response to Interrogatory No. 2:

Subject to the foregoing general objections, Thermo Finnigan answers as follows:

Use or operation of at least the ABI Prism 3700 DNA Analyzer has infringed at least claims 11 and 15 of the '654 patent. On information and belief, use or operation of other products in the ABI Prism family of products, such as the ABI Prism 310 Genetic Analyzer, the ABI Prism 3100 Genetic Analyzer, the ABI Prism 3100-Avant Genetic Analyzer, the Applied Biosystems 3730 DNA Analyzer, and the Applied Biosystems 3730xl DNA Analyzer, has also infringed at least claims 11 and 15 of the '654 patent for the same reasons. Thermo Finnigan's investigation of infringement by Applera devices is ongoing, and Thermo Finnigan reserves the right to supplement this response following further investigation and discovery.

Applera has infringed the '654 patent directly and indirectly, through contributory and induced infringement. Applera has literally infringed the '654 patent, but Thermo Finnigan reserves the right to review Applera's infringement under the doctrine of equivalents.

The ABI Prism 3700 DNA Analyzer performs capillary electrophoresis separations of DNA and infringes claims 11 and 15 as follows:

Claim 11	ABI Prism 3700
A method for detecting and separating anions in a sample using capillary electrophoresis comprising the steps of,	The separation technology in the ABI Prism 3700 is capillary gel electrophoresis, and the ABI Prism 3700 uses laser-induced fluorescence for detection. *ABI Automated DNA Sequencing, Chemistry Guide* 1-10 (2000) (hereinafter "*Chemistry Guide*").
providing a capillary filled with a carrier electrolyte,	Capillary tubes are filled with Genetic Analyzer Buffer during electrophoresis. *Chemistry Guide* at 5-2. A buffer may serve as a carrier electrolyte.
heating or cooling said capillary to a target temperature in the range of from 20°C to 60°C,	The run temperature is in the range of 50°C to 52°C. *Chemistry Guide* at 5-7.
introducing a sample containing one or more anions into said capillary,	Labeled DNA samples are introduced into the cathode side of the capillary. *Chemistry Guide* at 1-10. ABI sells a diagnostic kit for calibration of the ABI instruments that includes dye-labeled DNA oligonucleotides. On-line Store at http://www.appliedbiosystems.com. Under alkaline pHs (pH>7) used to separate DNA oligonucleotides, the oligonucleotides are anions, i.e., negatively charged.
applying an electrical current to said capillary under conditions causing anions in said sample to migrate and separate, and	Dye-labeled DNA fragments migrate from the cathode end to the anode end of the capillary under applied current and separate according to size. *Chemistry Guide* at 1-10 to 1-11.
detecting said anions by simultaneously monitoring said sample at two different wavelengths while maintaining the temperature in said capillary to within +/-0.5°C of said target temperature.	DNA is sequenced by simultaneous detection of four wavelengths; one for each base (e.g., A, T, C, G). *Chemistry Guide* at 1-3; *see also id.* at 1-11. The capillaries in the ABI Prism 3700 maintain the temperature in the capillary to within +/-0.5°C of the target temperature.
Claim 15	**ABI Prism 3700**
The method of claim 11 including the step of including an electroosmotic flow modifier in said carrier electrolyte.	A proprietary liquid polymer is used as the separating medium and introduced into a capillary before each run. *Chemistry Guide* at 5-2. The polymer coats the capillary wall and helps modify the electroosmotic flow. On-line Store at http://www.appliedbiosystems.com.

Response to Interrogatory No. 4:

Thermo Finnigan objects to the request to identify "each item of prior art" and "each individual" as overbroad and unduly burdensome. Subject to the foregoing general and specific objections, Thermo Finnigan answers as follows:

Thermo Finnigan is unaware of any material, non-cumulative prior art known to the inventors (or to individuals associated with the filing and prosecution of the application leading to the '654 patent) prior to the issue date of the patent that was not cited to the USPTO during prosecution.

Interrogatory No. 5:

Describe the facts and circumstances concerning Plaintiff's first awareness of each Applera device the use or operation of which is alleged to infringe any claim of the '654 patent, including in the description the date on which Plaintiff first became aware of the Applera device, or any prototype thereof, how Plaintiff gained awareness, identification of the persons who became aware, identification of all documents concerning such awareness, and for each accused Applera device state whether Plaintiff was aware of such device on January 31, 2003 and describe what was known to Plaintiff concerning each accused Applera device on that date.

Response to Interrogatory No. 5:

Thermo Finnigan objects to the request to identify "all documents" as overbroad and unduly burdensome. Thermo Finnigan objects to this interrogatory to the extent that it seeks information protected from disclosure by the attorney-client privilege and the attorney work product doctrine. Subject to the foregoing general and specific objections, Thermo Finnigan answers as follows:

Thermo Finnigan first became aware of Applera's infringement of the '654 patent in the fall of 2004. In approximately September 2004, Jim LaDine identified the '654 patent as a patent of interest and identified the ABI Prism 3700 DNA Analyzer as a capillary electrophoresis device relating to the subject matter of the '654 patent. Thermo Finnigan subsequently

conducted an investigation under the supervision of counsel, at which point it determined that use or operation of the ABI Prism 3700 DNA Analyzer infringed the '654 patent. Thermo Finnigan was not aware of Applera's infringement of the '654 patent on January 31, 2003.

Interrogatory No. 6:

State the factual basis for Plaintiff's contention that Applera has willfully infringed the '654 patent, identify the three persons having the most knowledge concerning such facts, and identify all documents that Plaintiff contends substantiate such facts.

Response to Interrogatory No. 6:

Thermo Finnigan objects to this interrogatory to the extent that it seeks identification of persons under Applera's control. Thermo Finnigan objects to the request to identify "all documents" as overbroad and unduly burdensome. Thermo Finnigan objects to the request to identify "the three persons having the most knowledge" as overbroad and unduly burdensome. Subject to the foregoing general and specific objections, Thermo Finnigan answers as follows:

Applera was aware of the '654 patent prior to April 16, 2002, when U.S. Patent No. 6,372,106, which is assigned to Applera and cites the '654 patent as a reference, issued. Despite this knowledge, Applera continued to infringe the '654 patent, and Thermo Finnigan is unaware of any reasonable care exercised by Applera to avoid that infringement.

Interrogatory No. 7:

Describe in detail all facts that Plaintiff contends constitute or evince any secondary considerations of nonobviousness with respect to each of the asserted claims of the '654 patent, identify the three persons having the most knowledge concerning such facts, and identify all documents that Plaintiff contends substantiate such facts.

Response to Interrogatory No. 7:

Thermo Finnigan objects to this interrogatory as premature; the subject matter of this interrogatory will be the subject of expert discovery. Thermo Finnigan objects to the request to

Interrogatory No. 15:

Describe the facts and circumstances that led Plaintiff to commence this suit when it did, including identification of the date on which Plaintiff first considered whether to sue Applera for alleged infringement of the '654 patent, identification of the information that prompted such consideration, identification of the date on which Plaintiff first learned such information, identification of the three persons having most knowledge concerning consideration of suit, and identification of all documents concerning consideration of suit.

Response to Interrogatory No. 15:

Thermo Finnigan objects to the request to identify "all documents" as overbroad and unduly burdensome. Thermo Finnigan objects to the request to identify "the three persons having most knowledge" as overbroad and unduly burdensome. Thermo Finnigan objects to this interrogatory to the extent that it seeks information protected from disclosure by the attorney-client privilege and the attorney work product doctrine. Thermo Finnigan incorporates its objections to Interrogatory No. 5. Subject to the foregoing general and specific objections, Thermo Finnigan answers as follows:

Thermo Finnigan incorporates its response to Interrogatory No. 5.

Interrogatory No. 16:

Describe the facts and circumstances concerning non-payment of the second maintenance fee for the '654 patent, including in such description an explanation of why the maintenance fee was not paid, identification of the three persons having most knowledge concerning why the maintenance fee was not paid, a description of any consideration given or efforts made directed to reinstating the '654 patent, identification of the three persons having most knowledge concerning such consideration or efforts, and identification of all documents concerning non-payment of the maintenance fee or any consideration given or efforts made directed to reinstating the '654 patent.

Response to Interrogatory No. 16:

Thermo Finnigan objects to the request to identify "all documents" as overbroad and unduly burdensome. Thermo Finnigan objects to the request to identify "the three persons having most knowledge" as overbroad and unduly burdensome. Thermo Finnigan objects to this

interrogatory to the extent that it seeks information protected from disclosure by the attorney-client privilege and the attorney work product doctrine. Subject to the foregoing general and specific objections, Thermo Finnigan answers as follows:

In February 2002, Thermo Finnigan decided not to pay the second maintenance fee for the '654 patent because Thermo Finnigan was no longer in the capillary electrophoresis business and was not aware of any infringement of the '654 patent. Thermo Finnigan has not attempted to reinstate the '654 patent.

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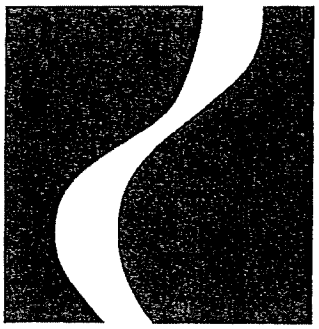
TAB 2



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analcimite *Petrology*. an extrusive or hypabyssal basalt that consists primarily of pyroxene and analcime. Also, **analcitite.**

analcimization *Geology*. in igneous rock, the replacement of feldspars or feldspathoids by the mineral analcime.

anal column *Anatomy*. a collection of longitudinal folds in the membrane of the anal canal.

analemma *Astronomy*. a figure-eight-shaped diagram, often placed on a terrestrial globe, that plots the sun's declination during the course of the year, as well as the equation of time.

analeptic *Pharmacology*. **1.** capable of restoring vigor; stimulating. **2.** any substance or medication that has an analeptic effect, such as caffeine or amphetamine.

anal-expulsive *Psychology*. of or relating to a phase of the anal stage in which sensual pleasure is obtained by expelling feces.

anal fin *Vertebrate Zoology*. an unpaired fin located in the middle of the posterior ventral part of a fish body, usually just behind the anus.

analgesia [an´əl jēz´yə] *Physiology*. **1.** the absence of a normal sensitivity to pain. **2.** the first stage below full consciousness through which an individual progresses after a general anesthetic has been administered, where he or she is still semiconscious but feels no pain.

analgesic [an´əl jēz´ik] *Pharmacology*. **1.** capable of relieving pain. **2.** any medication or other substance that relieves pain, such as aspirin.

anal gland *Vertebrate Zoology*. a gland that is located near the anus or rectum, usually serving an excretory or secretory function. *Invertebrate Zoology*. a gland in mollusks of the genus *Murex* that secretes a purple substance used in dyeing.

anallagmatic curve *Mathematics*. a curve that maps to itself under inversion in some circle. That is, every point on the curve can be considered to lie on a line containing a diameter of the circle (of radius r), and to each point is associated another point of the curve lying on the same line such that the product of the distances of the points from the center of the circle is the same as r^2.

analog a thing that is similar or comparable, but not identical, to another; specific uses include: *Evolution*. an organism that is similar to other organisms in function or behavior as a result of convergent evolution rather than common ancestry. *Chemistry*. a substance possessing a chemical structure and chemical properties similar to those of another substance. *Metrology*. representing information in a way that bears an exact relationship to the original information, by means of a continuous physical variable such as length, weight, voltage, or pressure. *Food Technology*. a substitute food that is manufactured from vegetable matter to look and taste like a meat or dairy product. Also, ANALOGUE.

analog adder *Electronics*. an analog signal whose output is the sum of two or more analog inputs.

analog clock *Horology*. a clock of the traditional type, in which time is represented by the position of hands that rotate on a dial, rather than by a numerical display.

analog communications *Telecommunications*. any system that uses a nominally continuous electrical signal.

analog comparator *Electronics*. a comparator that produces a high (binary 1) digital output signal when the sum of two analog voltages is positive or a low (binary 0) signal when the sum is negative.

analog computer *Computer Technology*. a computer in which information is stored and processed as physical values, such as voltages, that can vary smoothly between certain limits rather than having discrete, digital values.

analog data *Computer Technology*. the representation of information in a way that bears an exact relationship to the original information, so that it varies continuously rather than discretely as with digital data.

analogical control *Robotics*. control by signals from analog devices.

analog indicator *Electronics*. an indicator whose output is presented by pointer deflection or other continuously variable visual means. Similarly, **analog readout.**

analog multiplexer *Electronics*. a multiplexer that accepts only analog input signals.

analog multiplier *Electronics*. an analog circuit whose output is the product of two or more analog inputs.

analog network *Electronics*. a network whose voltage and current relationships are analogous to the relationships of some physical system.

analogous *Science*. relating to or being an analog; similar or comparable. *Biology*. similar in function and appearance, but not in structure or origin.

analogous pole *Solid-State Physics*. the positively charged pole of a crystal that arises when the crystal is heated.

analog radio system see AR SYSTEM.

analog recording *Electronics*. a method of recording material in which the recording signal varies in a manner analogous to the original signal.

analog signal *Electronics*. a signal whose parameters (such as amplitude, frequency, or phase) can change continuously over a given range, as distinguished from a digital signal where only some discrete values (usually 2) are considered significant.

analog simulation *Computer Programming*. the representation of physical systems that are describable by mathematical expressions, usually differential equations, containing variables which change continuously over time. *Electronics*. any electronic process that implements the transient behavior over time of a physical system.

analog states *Nuclear Physics*. the highly excited states of almost contiguous nuclear isobars that have identical nucleon wavefunctions except for the change of one or more neutrons into the same number of protons, resulting in a structure analogous to the original decaying state in the neighboring isobar. Also, ISOBARIC ANALOG STATES.

analog switch *Electronics*. a switching device that acts to pass the true analog signal of a transducer's output.

analog-to-digital converter *Electronics*. a device that changes a continuously variable quantity such as motion or electrical voltage into digital or discrete values. Thus, **analog-to-digital conversion.**

analog-to-frequency converter *Electronics*. a device that transforms an analog signal which is not in frequency form into a proportional change in frequency.

analogue see ANALOG.

analog voltage *Electronics*. a voltage representing an analog signal.

analog watch *Horology*. a watch of the traditional type, in which time is represented by the position of hands that rotate on a dial, rather than by a numerical display.

analogy a comparison of two things, based on their similarity in one or more respects; specific uses include: *Evolution*. a similarity in function or behavior among organisms or their anatomical structures resulting from convergent evolution rather than common ancestry. *Anthropology*. the practice or concept of using ethnographic information from recent cultures to make informed hypotheses about archaeological cultures, such as comparing the way of life of contemporary Kalahari Bushmen to that of Paleolithic African cultures.

anal plate *Vertebrate Zoology*. **1.** any of the plates at the rear of the ventral part of a turtle's shell. **2.** in snakes, a large scale just outside the anal opening.

anal-retentive *Psychology*. of or relating to a phase of the anal stage in which sensual pleasure is obtained by retaining feces.

anal sphincter *Anatomy*. a circular muscle surrounding and controlling the anal opening.

anal stage *Psychology*. in psychoanalytic theory, the second stage of psychosexual development, in the second year of life, during which the anus becomes the focus of sexual gratification through the sensations associated with carrying out or withholding bowel movements. Also, **anal period, anal phase.**

anal triangle *Anatomy*. the posterior half of the perineum.

analysand *Psychology*. a person who is undergoing psychoanalysis.

analysis *plural*, **analyses**. the separation of a thing into its constituent parts in order to study its nature; specific uses include: *Analytical Chemistry*. the detection and identification of the chemical composition of a substance, using classical laboratory techniques, microchemical interactions, and analytical instrumentation. *Psychology*. see PSYCHOANALYSIS. *Meteorology*. a detailed study of the state of the atmosphere based on actual observations. *Physics*. the separation of light into its prismatic components. *Mathematics*. the areas of mathematics that make use of the concepts of limits, convergence, and continuity. *Computer Programming*. see PROGRAM ANALYSIS.

analysis of covariance *Statistics*. a study of the effect of a set of both quantitative and qualitative variables on a quantitative response, with emphasis on the effect of the qualitative variables.

analysis of variance *Statistics*. a study of the effect of a set of qualitative variables on a quantitative response variable, based on a decomposition of the variance of the latter.

analyst *Psychology*. see PSYCHOANALYST.

analyte *Analytical Chemistry*. the substance being identified and measured in an analysis.

analytical of or relating to analysis. Also, **analytic.**

analytical balance *Engineering*. a precision balance that is designed to measure the mass of quantities to an accuracy ranging from 0.1 to 0.01 milligrams.

animikite *Mineralogy.* white or gray granular masses of silver ore consisting of a mixture of sulfides, arsenides, and antimonides, and often containing nickel and lead.

animism *Anthropology.* a belief in spiritual beings that are embodied in nature, such as animals, plants, and natural objects, and that are thought to have a soul, or anima. *Psychology.* the belief that inanimate objects or forces of nature, such as rivers, rocks, or trees, have human qualities such as thought and emotion. Also, ANIMATISM.

animistic relating to or characterized by animism.

animus *Psychology.* the masculine aspect of the female personality.

anion [an´ē ən; ə nī´ən] *Chemistry.* a negatively charged ion, which is attracted to an anode, the positive electrode in an electrolytic cell.

anion analysis *Analytical Chemistry.* a test for negatively charged particles (anions) in an aqueous solution.

anion exchange *Chemistry.* a process in which anions in solution exchange with anions in an insoluble matrix or resin.

anion-exchange resin *Analytical Chemistry.* a type of resin used in chromatography; characterized by the ability of negative ions in its immobilized (stationary) phase to be exchanged for anions in its solute (mobile phase).

anionic *Chemistry.* of or relating to an anion.

anionic detergent *Materials.* any of a class of detergents that have negatively charged surface ions.

anionic polymerization *Materials Science.* the addition polymerization of negatively charged species with a monomer that contains a double bond. *Organic Chemistry.* a type of polymerization catalyzed by Lewis bases.

anionotropy *Chemistry.* the breaking off of an ion (such as OH^- or X^-) from a molecule to leave a positive ion in a state of dynamic equilibrium.

anis- a combining form meaning "unequal."

Anisakidae *Invertebrate Zoology.* a family of parasitic roundworms in the superfamily Ascaridoidea; infectious in humans as a result of eating uncooked fish.

anisaldehyde *Organic Chemistry.* $C_6H_4(OCH_3)CHO$, either one of two compounds: **1. *o*-anisaldehyde.** a white to light tan crystalline solid that melts at 37–39°C and boils at 238°C; insoluble in water and soluble in alcohol; used as a chemical intermediate in making perfumes, food flavorings, and antihistamine medicines. **2. *p*-anisaldehyde.** a colorless to pale yellow liquid that boils at 248°C; insoluble in water; used in perfumes, antihistamines, and food flavorings.

anisate *Organic Chemistry.* any salt of anisic acid.

anise *Botany.* a plant, *Pimpinella anisum*, of the parsley family, having small, umbelliferous flowers and aromatic seeds (**aniseed**).

anise

aniseikonia *Medicine.* a condition in which the ocular image of an object as seen by one eye differs in size and shape from that seen by the other eye.

Anisian *Geology.* a European geologic stage of the lower Middle Triassic period, occurring after the Scythian and before the Ladinian.

anisic acid *Organic Chemistry.* $CH_3OC_6H_4COOH$, a white crystalline solid that melts at 184°C and boils at 275–280°C; slightly soluble in water and soluble in alcohol, ether, chloroform and benzene; used as an insecticide and in antiseptics. Also, *p*-METHOXYBENZOIC ACID.

anisic alcohol *Organic Chemistry.* $CH_3OC_6H_4CH_2OH$, a colorless liquid with a floral odor that is insoluble in water and soluble in alcohol and ether; it boils at 255–265°C; used in making perfumes and pharmaceuticals. Also, **anise alcohol, anisyl alcohol.**

anisidine *Organic Chemistry.* $CH_3OC_6H_4NH_2$, another name for *o*-, *m*-, or *p*-aminoanisole.

aniso- a combining form meaning "unequal," as in *anisotropic*.

anisocarpous *Botany.* of a flower, having fewer carpels than other floral parts, such as stamens.

anisochela *Invertebrate Zoology.* **1.** a type of sponge spicule with dissimilar ends. **2.** a chela (claw) in crustaceans with opposable parts of unequal size.

anisodesmic *Mineralogy.* of a compound or crystal, having ionic bonds of unequal strength.

anisogamete see HETEROGAMETE.

anisogamy see HETEROGAMY.

anisole [an´ə sōl´] *Organic Chemistry.* $C_6H_5OCH_3$, a toxic colorless liquid that freezes at –37.8°C and boils at 155°C, insoluble in water and soluble in alcohol, ether, acetone, and benzene; used as a solvent and in making perfumes. Also, METHYL PHENYL ETHER, METHOXYBENZENE.

anisomerous *Botany.* having an unequal number of parts in the floral whorls.

anisometric *Science.* not isometric; not being of equal size or measurement.

anisometric growth *Botany.* the unsymmetrical growth of a plant.

anisometric particle *Virology.* of a virus particle, not isometric, often rod-shaped rather than bullet-shaped.

Anisomyaria *Invertebrate Zoology.* an order of oysters, scallops, and mussels in the class Bivalvia, with the anterior adductor muscle highly developed and the posterior one only slightly developed.

Anisophylleaceae *Botany.* a family of dicotyledonous tropical trees and shrubs of the order Rosales, noted for accumulating aluminum; characterized by alternate simple leaves and by flowers borne on axillary spikes or racemes or on panicles on leafless shoots.

anisophyllous *Botany.* of a plant, having leaves of unequal sizes or shapes.

Anisoptera *Invertebrate Zoology.* a suborder of dragonflies in the order Odonata, having hind wings that are much wider than the front wings and are held horizontally at rest.

anisostemonous *Botany.* of a plant, having stamens that are unequal to the petals or sepals.

Anisotomidae *Invertebrate Zoology.* a family of fungus or carrion beetles in the order Coleoptera. Also, LEIODIDAE.

anisotropic *Physics.* relating to or having unequal physical properties along different directions. *Botany.* of a plant, having unequal dimensions along different axes. Also, **anisotropal.**

anisotropic inhibitor *Biochemistry.* a substance that reduces or prevents a metabolic or physiological process in only one direction.

anisotropic membrane *Chemical Engineering.* a filtration membrane consisting of a thin skin at the separating surface supported by a spongy sublayer.

anisotropy [an´ī sō´trə pē] *Materials Science.* the fact of being dependent on direction, especially in a crystalline lattice, of any mechanical, electrooptic, or magnetic property, such as elasticity, conductivity, or permeability. *Biology.* the condition of having unequal responses to external stimuli.

anisotropy constant *Electromagnetism.* a temperature-dependent parameter of a ferromagnetic material, associating magnitization in various directions to the anisotropy energy.

anisotropy energy *Electromagnetism.* the energy associated with a ferromagnetic crystal when the magnetization domain is rotated away from the direction of easy magnetization by an external field.

anisotropy factor see DISSYMMETRY FACTOR.

anisotropy of flow *Virology.* the orientation of different flows of particles in different directions.

Anitschkow's myocyte see ANICHKOV'S MYOCYTE.

ankaramite *Petrology.* a basalt with abundant phenocrysts of pyroxene and olivine and typically alkaline affinity.

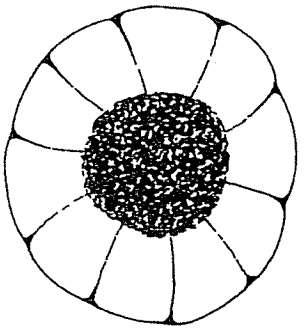
ankaratrite see OLIVINE NEPHELINITE.

anker *Metrology.* a unit of capacity equal to 10 U.S. gallons or 37.85 liters, used to measure liquids.

ankerite *Mineralogy.* $Ca(Fe^{+2},Mg,Mn)(CO_3)_2$, a white, gray, brown or pink trigonal, iron-rich mineral, with rhombohedral crystals, having a specific gravity of 2.97 to 3.02 and a hardness of 3.5 to 4 on the Mohs scale. Also, FERROAN DOLOMITE.

Ankistrodesmaceae *Microbiology.* a family of freshwater green algae of the order Chlorophyceae; also called Selenastraceae and used by some authorities to further segregate selected genera of the family Oocystaceae that have elongated or acicular cells.

Io the chemical symbol for ionium.
I/O *Computer Science.* a shorter term for input/output.
Iodamoeba *Invertebrate Zoology.* a genus of amebas that are commensal in human intestines.



Iodamoeba

iodargyrite *Mineralogy.* AgI, a yellow hexagonal mineral occurring as aggregates of prismatic or tabular crystals and as scaly masses, having a specific gravity of 5.69 and a hardness of 1.5 on the Mohs scale; found as a secondary mineral in oxidized silver ore deposits. Also, **iodyrite.**
Iodate *Inorganic Chemistry.* any compound derived from iodic acid and containing the IO_3^- ion.
iodeosin see TETRAIODOFLUORESCEIN.
iodic acid *Inorganic Chemistry.* HIO_3, colorless to pale-yellow crystals or powder; very soluble in water and decomposed by heat; toxic and an irritant; used in analytical chemistry and medicine.
iodic acid anhydride see IODINE PENTOXIDE.
iodide *Chemistry.* a compound of iodine with another element or radical, usually a binary compound with a metal.
iodide ion *Chemistry.* an iodine atom occurring in the -1 oxidation state.
iodide process *Metallurgy.* a reactive-metal-refining process based on the decomposition of metal iodides.
iodinated density-gradient medium *Molecular Biology.* a medium used for subcellular fractionation or separation of macromolecules by ultracentrifugation.
iodine [ī´ə dīn´] *Chemistry.* a nonmetallic halogen element having the symbol I, the atomic number 53, an atomic weight of 126.9045, a melting point of 113.5°C, and a boiling point of 184°C; occurs as grayish-black slates or granules; used in the production of dyes, water treatment, and medical disinfectants. *Pharmacology.* a preparation of this substance used as a topical anti-infective. (From the Greek *iodés* meaning "violet" because it sublimes to a dense violet vapor when heated.)
iodine-131 *Nuclear Physics.* a radioactive isotope of iodine with mass number 131 and a half-life of 8.04 days; used as a tracer in medical and industrial research.
iodine cyanide see CYANOGEN IODIDE.
iodine monobromide *Inorganic Chemistry.* IBr, dark gray crystals; soluble with decomposition in water; melts at 42°C and decomposes at 116°C; toxic and corrosive; used in organic synthesis.
iodine monochloride *Inorganic Chemistry.* ICl, a dark red solid or a brown oily liquid; soluble in alcohol and ether; decomposed by water and heat; used in analytical chemistry and organic synthesis.
iodine number *Analytical Chemistry.* a determination of the unsaturation of an organic compound by measuring the amount of iodine absorbed over a specific period of time. Also, **iodine value.**
iodine pentafluoride *Inorganic Chemistry.* IF_5, a toxic, colorless fuming liquid that freezes at 9.6°C and boils at 98°C; a dangerous fire risk that reacts violently with water; used as a fluorinating and incendiary agent.
iodine pentoxide *Inorganic Chemistry.* I_2O_5, a toxic, white crystalline powder; very soluble in water; decomposes at 300–350°C; used as an oxidizing agent and in organic synthesis. Also, IODIC ACID ANHYDRIDE.
iodine test *Analytical Chemistry.* a test for the presence of starch using a potassium iodide solution; a blue color indicates a positive test.
iodine trichloride *Inorganic Chemistry.* ICl_3, yellowish-brown deliquescent crystals that dissolve and decompose in water; decomposes at 77°C; toxic and corrosive to tissue; used as an antiseptic and in organic synthesis.
iodism *Toxicology.* poisoning due to the chronic ingestion of iodine.
iodoacetic acid *Organic Chemistry.* CH_2ICOOH, colorless crystals that are insoluble in water and alcohol; melts at 83°C; used in biochemical studies, for example, to inhibit enzyme activity.
iodoform *Organic Chemistry.* CHI_3, greenish-yellow crystals or powder having a penetrating odor; slightly soluble in water and alcohol; melts at 119°C and decomposes to free iodine above 200°C; used as a topical anti-infective.
iodoformism *Toxicology.* poisoning due to excessive exposure to the drug iodoform; symptoms may include skin problems.
iodometry *Analytical Chemistry.* the quantitative analysis of copper, gold, arsenic, and other elements or compounds using excess iodide ion as a reductant; the iodine freed in the associating reaction is determined by titration with potassium thiosulfate, using starch as an indicator.
iodonium *Inorganic Chemistry.* the H_2I^+ or R_2I^+ cation.
iodophor *Chemistry.* any carrier of iodine.
iodopsin *Biochemistry.* a pigment found in the cones of the retina, responsible for day or color vision. Also, VISUAL VIOLET.
iodosylbenzene *Organic Chemistry.* C_6H_5IO, a colorless, amorphous powder; soluble in hot water and alcohol; explodes at 210°C; used as an oxidizing agent. Also, **iodosobenzene.**
iodothyronine *Biochemistry.* any of several thyroid hormones, such as thyroxine and triiodothyronine, formed by the oxidative coupling of two iodotyrosines by an ether linkage in the *para* configuration, formed by the enzyme thyroid peroxidase.
iodotyrosine *Biochemistry.* a precursor of thyroxine and triiodothyronine, the thyroid hormones.
iodoxybenzene *Organic Chemistry.* $C_6H_5IO_2$, colorless needles that are soluble in water; melts at 167°C and explodes at 236–237°C; used as an oxidizing agent.
Ioffe bars *Physics.* the heavy bars used in certain controlled fusion reactors to carry the current that helps stabilize the plasma.
Iojap *Genetics.* a mutant chromosomal gene that occurs in corn and causes the chloroplasts in the cells to undergo changes.
ion [ī´ən; ī´ən] *Chemistry.* an atom, radical, or molecule that has gained or lost one or more electrons and thus acquired a net negative or positive charge. In electrolysis, positive ions (cations) travel to the cathode, while negative ions (anions) travel to the anode. (Coined by Michael Faraday, from a Greek form meaning "going.")
Ion. ionic.
ion accelerator *Nucleonics.* a machine in which an electric field produced by external oscillators or amplifiers propels electrons in a straight line to produce a beam of highly charged particles.
ion-acoustic wave *Physics.* a longitudinal compression wave in the ion density of a plasma that can occur at high electron temperatures and low frequencies, and is caused by a combination of ion inertia and electron pressure.
ion atmosphere *Physical Chemistry.* a cloudlike configuration of ions that are loosely bound around an ion of the opposite charge. Also, ION CLOUD, ION CLUSTER.
ion backscattering *Solid-State Physics.* the scattering in a near-backward direction of an ion beam incident on a film or body.
ion-beam mixing *Engineering.* the bombardment of a substance with high-energy ions so as to cause the intermixing of atoms of two different phases in the near-surface region.
ion-beam scanning *Electronics.* the process by which the mass spectrum of an ion beam is analyzed, generally by altering the electric or magnetic fields or by moving a probe in a mass spectrometer.
ion chamber see IONIZATION CHAMBER.
ion channel *Biochemistry.* a transmembrane pore that presents a hydrophilic channel for ions to cross a lipid bilayer down their electrochemical gradients.
ion cloud *Geophysics.* a region of enhanced ion density in the ionosphere, often occurring in the E layer.
ion cloud or **ion cluster** see ION ATMOSPHERE.
ion column *Geophysics.* the visible train of ionized gas left by a meteorite entering the atmosphere.
ion concentration see IONIZATION DENSITY.
ion current *Physics.* a current caused by a flow of positively charged ions.
ion-cyclotron-resonance mass spectrometer *Spectroscopy.* a mass spectrometer in which the mass distribution of orbiting ions in a magnetic field is detected by bringing ion frequencies sequentially into resonance with applied radio frequencies.
ion density *Physics.* the number of ions per unit volume.

monoiodotyrosine *Endocrinology.* a metabolic precursor of the thyroid hormones triiodothyronine (T_3) and thyroxine (T_4).
monokaryotic *Cell Biology.* containing one nucleus per cell.
monokine *Virology.* any of the soluble mediators of immune responses that are not antibodies or complement components, and that are produced by mononuclear phagocytes.
monolayer see MONOFILM.
monolayer culture *Biotechnology.* a single layer of cells growing on the surface of the support matrix or a culture medium.
monolinuron *Organic Chemistry.* $C_9H_{11}N_2O_2Cl$, a colorless solid, slightly soluble in water; melts at 75°C; used as an herbicide on crops and ornamental plants. Also, MSMA.
monolith *Architecture.* **1.** a column, obelisk, statue, or the like that is made from a single block of stone. **2.** a large block of stone, especially when used in building or sculpture. *Civil Engineering.* a sizable solid block without joints, as in reinforced-concrete constructions.
monolithic *Science.* of, relating to, or made from a single uniform piece of material.
monolithic ceramic capacitor *Electronics.* a capacitor made up of thin dielectric layers interleaved with staggered metal-film electrodes; it is compressed to form a solid monolithic block.
monolithic filter *Telecommunications.* a filter, mounted or electroplated on a single quartz or ceramic substrate, that separates telephone communications sent over the transmission line at the same time.
monolithic integrated circuit *Electronics.* a circuit formed in a single piece of the substrate material, in which physically separate circuit components are electrically interconnected to form the final circuit.
monomania *Psychology.* **1.** a psychological disorder characterized by an abnormal preoccupation with one idea or subject. **2.** loosely, any inordinate preoccupation with a single idea, subject, goal, or the like.
Monomastigales *Botany.* an order of marine and freshwater green flagellate algae of the class Prasinophyceae, composed of the single family Monomastigaceae and characterized by one or two flagella attached laterally or at one pole of the cell and an organic scale covering on the cells and sometimes on the flagella.
monomer *Chemistry.* a relatively simple compound, usually containing carbon, that is able to combine in long chains with other like or unlike molecules to produce very large polymers.
monomeric *Chemistry.* relating to, characteristic of, or resembling a monomer.
monomerous *Botany.* of or relating to a flower with a single member in each whorl. Also, 1-MEROUS.
monomial *Systematics.* of a name, consisting of a single word or term. *Mathematics.* a polynomial having exactly one term; that is,

$$a x_1^{k_1} x_2^{k_2} \cdots x_n^{k_n},$$

where a is an (nonzero) element of the ring of coefficients and the $x_1, x_2, \ldots, x_n$ are indeterminates. The **degree of the monomial** is the sum $k_1 + k_2 + \cdots + k_n$.
monomineralic *Petrology.* consisting wholly or chiefly of one mineral.
Monommidae *Invertebrate Zoology.* a family of beetles, coleopteran insects in the superfamily Tenebrionoidea, that feed on decaying plant material.
monomode fiber *Materials Science.* an optical fiber that offers only one path, or mode, for light propagation. These fibers give the best performance in terms of the simultaneous achievement of high information rate and low loss.
monomolecular film or **monomolecular layer** see MONOFILM.
monomorphic *Biology.* **1.** having or exhibiting only a single form. **2.** of the same or similar structure (as another organism or part).
monomorphic locus *Genetics.* a locus that is occupied by a single allele in a population, or one in which the most common allele has a frequency greater than 95%.
Mononchoidea *Invertebrate Zoology.* a superfamily of predatory nematodes found in soil and fresh water.
mononeuritis *Neurology.* an inflammation of a single nerve.
mononeuropathy *Neurology.* a disease affecting a single nerve.
mononuclear *Cell Biology.* having a single nucleus.
mononuclear phagocyte see MACROPHAGE.
mononucleosis [mä´nō noo´klē ō´sis] *Medicine.* **1.** the presence of an abnormally large number of mononuclear leukocytes in the blood, as in glandular fever. **2.** see INFECTIOUS MONONUCLEOSIS.
monooxygenase *Biochemistry.* an enzyme of the oxidoreductase class that catalyzes the incorporation of an oxygen atom into a substrate molecule and reduces the other atom into water.
monoparesis *Neurology.* the slight or incomplete paralysis of a limb or part of a limb.
Monopectinate *Invertebrate Zoology.* pectinate (comblike) along one side only.
monopetalous *Botany.* **1.** having a corolla of united petals, as in the morning glory. **2.** having a single petal in the corolla.
monophagous *Zoology.* feeding only on one kind of food. Also, MONOTROPHIC.
monophasia *Neurology.* a form of aphasia characterized by the ability to speak only one word or phrase, which is repeated constantly.
monophenol monooxygenase see TYROSINASE.
Monophisthocotylea *Invertebrate Zoology.* an order of trematode parasites in the subclass Monogenea.
Monophlebinae *Invertebrate Zoology.* a subfamily of homopteran insects in the superfamily Coccoidea.
monophonic sound see MONAURAL SOUND.
monophyletic *Systematics.* of or relating to a clade. *Evolution.* of or relating to any group sharing a single ancestral form.
monophyletic theory *Hematology.* the theory that all forms of blood cells, both red and white, have their origin in one and the same form of primordial blood cell (hemocytoblast), with the several types of cells arising by a process of differentiation. Also, UNITARIAN THEORY.
monophyllous *Botany.* consisting of or having a single leaf.
monophyodont *Vertebrate Zoology.* having a single set of teeth that are not replaced at a later stage of growth.
monopinch *Electronics.* the application of monopulse techniques in which the error signal is used to discriminate against jamming signals.
Monopisthocotylea *Invertebrate Zoology.* a suborder of trematodes with a hooked posterior adhesive disk; ectoparasites of fish, amphibians, and crustaceans.
Monoplacophora *Invertebrate Zoology.* a small class of primitive marine mollusks with a single dorsal shell and signs of segmentation.
monoplane *Aviation.* an airplane having only one main wing or lifting surface, usually divided into two parts by the fuselage; the most common general type of airplane.

monoplane

monoplegia *Medicine.* the paralysis of a single limb or a single muscle group.
monoploid *Genetics.* **1.** a somatic cell or individual having one set of chromosomes. **2.** the basic chromosome number in a polyploid mutant.
monopodial *Botany.* having stems branching from a single main axis.
monopodium *Botany.* the single primary axis from which all lateral branches develop.
monopole see MAGNETIC MONOPOLE.
monopole antenna *Electromagnetism.* an antenna that acts as half of a dipole antenna, with the other half formed by the electrical image in the ground plane; usually in the form of a vertical tube or a helical element, on which the current distribution forms a standing wave.
monopropellant *Materials Science.* a propellant that combines fuel and oxidizer in a single substance, especially a liquid fuel for rockets. *Space Technology.* using such a propellant. Thus, **monopropellant rocket, monopropellant engine.**
monopulse radar or **monopulse tracking** *Engineering.* radar capable of obtaining directional information with great accuracy; four overlapping pencil beams (two for azimuth, two for elevation) and special circuitry are arranged so that when the target is at center, voltage dissipates. Also, SIMULTANEOUS LOBING, STATIC SPLIT TRACKING.

TAB 3

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Thermal model of capillary electrophoresis and a method for counteracting thermal band broadening

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ABSTRACT

Thermal band broadening is known to be caused by the temperature dependence of ionic mobility. This dependence also strongly influences the temperature of the capillary by providing positive feedback between the temperature and power density. Previous thermal models of capillary electrophoresis have not fully considered this "autothermal effect". We show that it always causes a capillary to run hotter than is predicted by a constant conductivity model; temperature excursions two times greater are typical.

We propose that the thermally induced parabolic distortion of the migration velocity can be countered with an opposing Poiseuille (pressure-driven) flow. Dispersion calculations indicate that it may be possible to obtain plate numbers in excess of 10^6 m^{-1} even in very large bore (400 μm) capillaries.

INTRODUCTION

Capillary electrophoresis (CE) is characterized by voltage gradients of 100–300 V/cm. Depending upon the buffer conductivity, power density can reach 1 kW/cm^3. A significant radial temperature gradient arises as a consequence in the capillary lumen. Jorgenson and Lukacs[1] pointed out that such gradients may cause band broadening through thermal Taylor dispersion[2]: In the warmer region near the center of the lumen, the temperature dependence of electrophoretic mobility increases migration velocities relative to the wall region. The solute band is distorted in a parabolic fashion, as sketched in Fig. 1 (where we depict a solute that migrates opposite the direction of electroosmotic flow). Radial molecular diffusion tends to average out radial concentration variations, so that dispersion appears to proceed by a diffusive rather than convective mechanism. Grushka *et al.*[3] have investigated this effect mathematically, and find that this mechanism can indeed produce significant band broadening.

It is known from large-scale electrophoresis[4] that the temperature dependence of the buffer ions' mobility strongly influences the buffer temperature through the "autothermal effect". As the buffer in an electrophoresis apparatus warms due to the passage of current, its conductivity rises. If the power supply is operated in